INTERNATIONAL BROADCASTING NETWORK
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May 4, 2013

BY ECFS

Ms. Marlene Dortch
Secretary
Federal Communications Commission
445 12th Street S.W.
Washington, DC 20554

Re: In the Matter of Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, GN Docket No. 12-268

Dear Ms. Dortch:

Attached are two articles showing that claims of a "wireless spectrum crisis" are false.

The first, written by Brian X. Chen and published by the *New York Times*, is entitled "Carriers Warn of Crisis in Mobile Spectrum." The article features Martin Cooper, the inventor of the cellphone, and David P. Reed, one of the original architects of the Internet and a former professor of computer science and engineering at the Massachusetts Institute of Technology.

The second, written by Sebastian Anthony and published by *Extreme Tech*. is entitled "Vortex radio waves could boost wireless capacity 'infinitely'." This article features Bo Thide of the Swedish Institute of Space Physics, and provides a link to a scholarly article in the *New Journal of Physics*.

These articles represent just a small sampling of a vast amount of evidence that the so-called "wireless spectrum crisis" is a hoax and has no basis in truth. As International Broadcasting Network and others have previously shown, the Commission's proposals are bad policy, contrary to the public interest and in violation of the Constitution, various statutes and its own rules.

Accordingly, the Commission should terminate this proceeding and abandon its plans to reclaim and repurpose television spectrum.

Respectfully submitted,

Paul J. Broyles

Paul J. Broyles
President

Attachments

The New York Times

Carriers Warn of Crisis in Mobile Spectrum

Are We Running Out of Spectrum?: Wireless companies say that smartphones are threatening to overwhelm their networks, and are asking the government for help. But some experts maintain that technology already has the answers.

By BRIAN X. CHEN

Published: April 17, 2012

AT&T, Verizon, T-Mobile and Sprint say they need more radio spectrum, the government-rationed slices of radio waves that carry phone calls and wireless data.

Eloy Alonso/Reuters

Martin Cooper, the inventor of the cellphone, says that claims by mobile carriers of a so-called spectrum crisis are largely exaggerated.

The wireless carriers say that in the next few years they may not have enough of it to meet the exploding demands for mobile data.

The result, they ominously warn, may be slower or spotty connections on smartphones and tablets. They imply in carefully couched language that, given the laws of supply and demand, the price of cellphone service will soar.

It will affect “the services they’re paying for because of the capacity issues,” said Ed McFadden, Verizon’s vice president for policy communications. “It potentially hinders our ability to meet consumer need.”

But is there really a crisis? Some scientists and engineers say the companies are playing a game that is more about protecting their businesses from competitors.

Not even the inventor of the cellphone, Martin Cooper, is convinced that the wireless industry faces a serious challenge that cannot be overcome with technology. Mr. Cooper, a former vice president of Motorola and chairman of Dyna L.L.C., an incubator for new companies, says that claims of a so-called spectrum crisis are largely exaggerated.

“Somehow in the last 100 years, every time there is a problem of getting more spectrum, there is a technology that comes along that solves that problem,” he said in an interview. Mr. Cooper also sits on the technical advisory committee of the Federal Communications Commission, and he previously founded ArrayComm, a company that develops software for mobile antenna technologies, which with he said he is no longer associated.

He explained that for carriers, buying spectrum is the easiest way for them to expand their network, but newer technologies, like improved antennas and techniques for offloading mobile traffic to Wi-Fi networks, could multiply the number of mobile devices that carriers can serve by at least tenfold.

Everyone agrees that data-guzzling smartphones and tablets are selling fast, and the wireless industry needs to keep up. Cisco, the networking company, published a study that shows mobile data usage more than doubled in 2011.

Cellphones are radios and their calls are carried on the electromagnetic radio spectrum just like an FM radio signal or a walkie-talkie. The F.C.C. divides up the spectrum by bands of frequency, under the theory that no one wants signals on certain frequencies interfering with one another.

The F.C.C. hands out licenses for each frequency band to entities like the military, TV stations, astronomy researchers and the phone carriers. Carriers now want some of the spectrum others have and are seeking approval from the F.C.C. to buy it at government auction or by buying licenses for it.

Verizon, the largest carrier in the country, has been on the hunt for more. It has been trying to buy wireless spectrum licenses from a group of cable companies, including Time Warner and Comcast. These transactions are being opposed by T-Mobile USA and some other smaller players in the wireless industry. AT&T’s ill-fated deal to buy T-Mobile came about in large part to get more spectrum.

The F.C.C. believes that a combination of adding new spectrum and using new technologies will be needed to help the wireless industry evolve. “No single action is a silver bullet when it comes to meeting mobile capacity needs,” said Neil Grace, an F.C.C. spokesman. “More efficient use of spectrum, new technologies, and unleashing new spectrum are all important parts of the mix.”

Arguing that the nation could run out of spectrum is like saying it was going to run out of a color, says David P. Reed, one of the original architects of the Internet and a former professor of computer science and engineering at the Massachusetts Institute of Technology. He says electromagnetic spectrum is not finite.

Mr. Reed, who is now senior vice president at SAP Labs, a company that provides business software, explained that there are in fact newer technologies for transmitting and receiving signals so that they do not interfere with one another. That means separating the frequency bands would not be required — in other words, everybody could share spectrum and not run out.

The reason spectrum is treated as though it were finite is because it is still divided by frequencies — an outdated understanding of how radio technology works, he said. “I hate to even use the word ‘spectrum,’ ” he said. “It’s a 1920s understanding of how radio communications work.”

Why, then, wouldn’t carriers want to use these newer technologies that cause frequencies to not interfere? Because licensing spectrum is a zero-sum game. When a company gets the license for a band of radio waves, it has the exclusive rights to use it. Once a company owns it, competitors can’t have it.

Mr. Reed said the carriers haven’t advocated for the newer technologies because they want to retain their monopolies.

David S. Isenberg, who worked at AT&T Labs Research for 12 years before leaving to start an independent consulting firm, said the carriers have been deliberately slow with adopting more advanced radio technologies. He said that spectrum licenses come with obligations where carriers had to agree to serve the public interest, but those agreements have significantly weakened. “Their primary interest is not necessarily in making spectrum available, or in making wireless performance better,” he said. “They want to make money.”

Mr. Cooper, the inventor of the mobile phone, says that rather than give the carriers a few more slices of spectrum, he suggests requiring them to use newer technologies that amplify their networks.

He said that currently the technology with the most potential for carriers to use their networks more efficiently is the smart antenna. A traditional radio antenna on a cellphone tower spews energy out in all directions, but only a portion of it gets to the right phone, he explained. By contrast, the smart antenna would direct energy straight at the phones, and as a result, current spectrum would be put to more efficient use.

Fourth-generation LTE networks are supposed to adopt smart antennas, but most carriers haven't started installing these yet, he said. These new antennas will also start shipping in phones in the next two years, which would make even better use of the network, he said.

In interviews, representatives of AT&T, Verizon, T-Mobile and Sprint said new technology would not be enough to solve all their problems, and they said they would eventually need access to more of the nation's radio waves. "They're all Band-Aids, and you have to provide additional spectrum to deal with the wound to deal with the large capacity of bandwidth demands," said Kathleen Ham, vice president for federal regulatory affairs of T-Mobile USA.

Mr. Cooper doesn't agree.

"Every two and a half years, every spectrum crisis has gotten solved, and that's going to keep happening," Mr. Cooper said. "We already know today what the solutions are for the next 50 years."

Vortex radio waves could boost wireless capacity “infinitely”

By Sebastian Anthony on March 2, 2012 at 7:07 am

After four years of incredulity and not-so-gentle mocking, Bo Thide of the Swedish Institute of Space Physics and a team in Italy have finally proven that it’s possible to simultaneously transmit multiple radio channels over exactly the same wireless frequency. In theory, according to Thide, we could potentially transmit an “infinite number” of TV, radio, WiFi, and cellular channels at the same time over the same frequency, blasting apart our highly congested wireless spectrum.

Thide’s approach is rather simple. Basically, electromagnetic waves can have both spin angular and orbital angular momentum (OAM). If you picture the Earth-Sun system, spin momentum is the Earth rotating on its axis (producing the day-night cycle), and orbital momentum is the Earth rotating around the sun (producing the seasons). In standard wireless communications — radio, TV, WiFi — we only modulate the spin angular momentum of waves. For years, Thide had theorized that orbital angular momentum could also be added to wireless signals, effectively creating a spiral signal that looks like fusilli pasta; or, in the words of Thide, a “radio vortex.”

Now, in an experiment in Venice, Thide and his Italian colleagues have transmitted two signals at the same time, on the same frequency, over a distance of 442 meters (1450ft). Pictured on the right is the antenna that the team used. No, your eyes don't deceive you: To create these radio vortices, all you have to do is make a cut in a standard parabolic reflector and twist it slightly. If you imagine a corkscrew of radio signals being continuously transmitted from the outside edge of the antenna, that's effectively what's occurring. On the receiving end, there are two "normal" TV antennae (Yagi-Uda) set apart by the same angle as the break in the transmitter. These antennae "decode" the vortex, and voila: Two radio signals transmitted over the same frequency.

It is hard to put into words just how significant Thide's discovery could be. If the vortex preserves other aspects of wireless communications, such as multiplexing, then in the short term we could be looking at a wireless spectrum that can carry 10 or 20 times as much data. In the long term, as our understanding of orbital angular momentum grows, our wireless spectrum could effectively be infinite. To be honest, this is such a huge twist for wireless communications that the full repercussions are not yet known.

With radio and TV, and now cellular networks, wireless spectrum is one of humanity's most valued resources. It is because airwaves are so clogged that companies like Verizon or Vodafone pay billions of dollars for just a few megahertz. If Thide's discovery pans out, not only would wireless spectrum lose most of its value, but the trouble and strife surrounding LightSquared, international roaming, LTE rollout, white space wireless, and digital TV simply cease to be.

Read more at New Journal of Physics